

Appl. No. : 8/932,228
Filed : September 17, 1997

REMARKS

Anticipation Rejections

The Examiner has rejected Claims 11 and 15 under 35 U.S.C. § 102(a) as being anticipated by Anjum et al. (U.S. Patent No. 5,372,951).

Applicants have amended Claim 11 to recite the recessed portion having a “vertical sidewall.” Applicants respectfully submit that the amendment is fully supported by the application as originally filed. *See, e.g.*, p. 5, lines 5-14 (“A preferred characteristic of the trenches 14 is the steep sidewall profile as compared to conventional LOCOS processes.”). Moreover, Claim 11 as filed originally had recited a “recessed portion” that was not intended to encompass LOCOS structures.

The amendment was not previously offered because Applicants were not presented with any prior art teaching halide doping of isolation elements until the present Final Office Action. In the previous Office Action, the Examiner had applied a reference that was not prior art to the present application. Being now presented with Anjum et al., Applicants offer the amendment to further clarify a structural distinction between the LOCOS structure of Anjum et al. and the trench-fill structure of Claim 11.

In view of the amendment, Applicants respectfully submit that Anjum et al. did not teach each and every feature of Claim 11, nor of dependent Claim 15, and that the rejections for anticipation are overcome.

Obviousness Rejections

The Examiner has rejected Claims 12-14 and 16 under 35 U.S.C. §103(a) as being unpatentable over Bose et al. (U.S. Patent No. 5,492,858) in view of Anjum et al. (U.S. Patent No. 5,372,951).

As noted above, Anjum et al. taught thermally growing an oxide in accordance with a conventional LOCOS (local oxidation of silicon) process, whereby silicon nitride material is used to mask active regions of the substrate surface from the growth of field oxide. After initial oxidation, a subsequent implantation of fluorine ions into the LOCOS-grown oxide dislodged oxygen atoms for recombination with silicon atoms at the field oxide/silicon substrate interface. Anjum et al. further oxidized the fluorine-implanted field oxide, thereby thickening small oxide features as compared to larger features. This teaching thus related exclusively to LOCOS operations and resultant structures.

In contrast, independent Claim 11 clearly relates to a trench-fill structure. The LOCOS process of Anjum et al. and its resultant structure are readily distinguished from a recessed portion, having a vertical sidewall, filled with dielectric. Moreover, the halide addition step of Anjum et al. was taught to be useful *exclusively* in the context of LOCOS-grown oxide; the skilled artisan would not appreciate from Anjum et al. that the use of fluorine in forming field oxide might be applicable or even useful for trench-fill field oxide.

Thus, the skilled artisan would not have applied the addition of fluorine taught by Anjum et al. to a trench fill structure. Accordingly, Applicants submit that Claim 11 is not rendered obvious by the combination of Anjum et al. (fluorine in LOCOS oxidation) with Bose et al. (conventional trench fill with undoped oxide). Moreover, Anjum et al. specifically *taught against* deposition techniques (which are used in trench-fill) for field oxidation, since thermal oxidation is said to produce better quality films. See Anjum et al. at Col. 1, lines 25-30 and 40-44.

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Dependent Claims 12-16 depend from independent Claim 11 and therefore include all the features and limitations thereof. Furthermore, the dependent claims add further distinguishing features of particular utility.

Accordingly, Applicants respectfully submit that the obviousness rejections are overcome and that the pending claims are allowable over Bose et al. in view of Anjum et al.

CONCLUSIONS

In view of the foregoing remarks, Applicants respectfully request entry of the amendment and reconsideration of the rejections. If some issue remains that the Examiner feels can be addressed by Examiner's Amendment, the Examiner is cordially invited to call the undersigned to discuss the same.

Respectfully submitted,

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